Audrey E. Hendricks, PhD

GENERAL INFORMATION

Mailing Address:	University of Colorado Denver P.O. Box 173364 Denver, CO 80217-3364	*Google Scholar*: All publications h-index = 16 i10-index = 22 1778 citations (1353 since 2015)
Telephone	(303) 315-1722	37 peer reviewed journal articles
E-mail	audrey.hendricks@ucdenver.edu	6 first author (5 corresponding author)
Website	http://math.ucdenver.edu/~ahendricks	1 co-first author and corresponding author
Github	*https://github.com/hendriau*	

CURRENT INTERESTS

I am a statistical geneticist and biostatistician interested in the complex nature of human diseases and traits. This includes both applied and methodological development in the incorporation of multiple datasets and types (genetic, genomic, and environmental) to decipher complex relationships. My work has involved research across many settings including large scale genetic association, methylation, metabolomic, microbiome, and expression studies as well as more focused brain and mouse studies. My recent methodological work includes developing methods to use common controls from high-throughput sequencing studies and longitudinal analysis methods for multiple 'omics data. Recent applied and collaborative projects include identifying methylation, metabolomic, and microbiome modifiers in nutrition intervention studies for pregnant women and their offspring as well as foodomics studies. In addition to moving forward the fields of science and statistics, I am passionate about training the next generation of statisticians, scientists, and critical thinkers. I mentor many amazing graduate students and have an active and dynamic research group working on statistical challenges in the study of health and disease.

KEY WORDS

Statistics, biostatistics, genetics, data science, 'omics, obesity, face shape, big data, nutrition

EDUCATION

Visiting Postdoctoral Fellow (Sept. 2012-Aug. 2013); **Broad Institute of MIT and Harvard** & **Massachusetts General Hospital**; *Assistant Professor of Medicine for Harvard Medical School-Diabetes Unit, Jose Florez*

Statistical Genetics Postdoctoral Fellow (Sept. 2011-Aug. 2013); **Wellcome Trust Sanger Institute, Cambridge University**; *Head of Human Genetics & Metabolic Disease Group Leader, Inês Barroso*; *Analytical Genomics of Complex Traits Group Leader, Eleftheria Zeggini*

Ph.D in Biostatistics (2012); **Boston University**, Graduate School of Arts and Sciences
Dissertation: "Exploration of Gene Region Simulation, Correction for Multiple Testing, and Summary Methods"; Thesis Advisor: Kathryn L. Lunetta, PhD

B.A. in Economics (2002); **University of Colorado**, College of Arts and Sciences; Magna Cum Laude

B.A. in Music (2002); **University of Colorado**, College of Music

Audrey E. Hendricks, PhD

PROFESSIONAL POSITIONS

Primary Appointment
Assistant Professor –Department of Mathematical and Statistical Sciences, University of Colorado Denver (Aug. 2013 – Present)

Other Roles
Faculty, Human Medical Genetics Program, University of Colorado Anschutz Medical Campus (Oct. 2013 – Present)

Assistant Professor – secondary appointment, Department of Biostatistics and Informatics, University of Colorado School of Public Health (Oct. 2013 – Present)

Assistant Professor – secondary appointment, Colorado Center for Personalized Medicine, University of Colorado Anschutz Medical Campus (Sep. 2018 – Present)

Previous
Scientific Advisory Board, Human Code, (April 2017-Feb. 2018)

Consultant, Statistical Genetics, Wellcome Trust Sanger Institute (Aug. 2013-Dec. 2017)
Head of Human Genetics & Metabolic Disease Group Leader, Inês Barroso

Statistical Genetics Consultant for NHLBI Framingham Heart Study (March 2010-Aug. 2011)
Associate Dir. and Scientific Dir. of SHARe Project, Framingham Heart Study, NHLBI, Christopher O'Donnell
Director, Framingham Heart Study, NHLBI, Daniel Levy

AWARDS AND FELLOWSHIPS

2019	College of Liberal Arts and Sciences Excellence in Research Award (3 given per year), University of Colorado Denver
2018	NIH Big Data Innovation Lab in Single Cell Dynamics Attendee (30 early career investigators chosen to attend), Bend, Oregon
2013 & 2014	Young Upwardly Mobile Professors Award, University of Colorado - Denver
2012	Stellar Abstract Award, Program in Quantitative Genomics (PQG) Conference, Harvard School of Public Health
2011	Outstanding Advisor Award, FSILG, MIT
2008	Statistics in Epidemiology Travel Award to the American Statistical Associations Joint Statistical Meeting
2008	Boston University Women Graduates' Club Scholarship
2007	Kappa Alpha Theta Betty B. & James B. Lambert Foundation Scholarship
2007	Induction into Mu Sigma Rho, National Honor Society for Statistics
2005-2007	NIGMS Training Grant in Biostatistics, Boston University
2002	Magna Cum Laude in Economics, University of Colorado: In recognition of overall academic study and completion of Honors Thesis
1997-2002	Dean's List, University of Colorado
2000	International Study Abroad Merit Scholarship, Boulder, Colorado
1999	Winnifred Dick Ingals Scholarship, Denver, Colorado
1998	Dean's Scholarship, University of Colorado

PUBLICATIONS (in descending chronological order; students/mentees[#])

1. Reisdorph NA, **Hendricks AE**, Tang M, Doenges KA, Reisdorph RM, Tooker BC, Quinn K, Borengasser SJ, Nkrumah-Elie Y, Frank DN, Campbell WW, Krebs NF. (2020). "Nutrimetabolomics reveals food-specific compounds in urine of adults consuming a DASH-style diet." Sci Rep **10**(1): 1157.

2. Gilley SP, Weaver NE[#], Sticca EL[#], Jambal P, Palacios A, Kerns ME, Anand P, Kemp JF, Westcott JE, Figueroa L, Garcés AL, Ali SA, Pasha O, Saleem S, Hambidge KM, **Hendricks AE**, Krebs NF, Borengasser SJ. Longitudinal Changes of One Carbon Metabolites and Amino Acid Concentrations during Pregnancy in

the Women First Maternal Nutrition Trial. *Current Developments in Nutrition*, **2020**. https://doi.org/10.1093/cdn/nzz132

3. Kordas G, Rudra P, **Hendricks A**, Saba L, Kechris K. Insight into genetic regulation of miRNA in mouse brain. *BMC genomics*, **2019**.
4. Tang M, Frank DN, Tshefu A, Lokangaka A, Goudar SS, Dhaded SM, Somannavar MS, **Hendricks AE**, Ir D, Robertson CE, Kemp JF, Lander RL, Westcott JE, Hambidge KM, Krebs NF. Different Gut Microbial Profiles in Sub-Saharan African and South Asian Women of Childbearing Age Are Primarily Associated with Dietary Intakes. *Frontiers in Microbiology*, **10**(1848), **2019**.
5. Yang Y, van der Klaauw A, Cacciottolo T, Stadler L, Keogh J, Henning E, Banton M, **Hendricks AE**, Bochukova E, Mistry V, Lawler K, Liao L, Xu J, O'Rahilly S, Tong Q, UK10K Consortium, Barroso I, O'Malley B, and Xu Y. Steroid Receptor Coactivator-1 Modulates the Function of Pomc Neurons and Energy Homeostasis. *Nature Communications*, **2019**; 10(1):1718. doi: 10.1038/s41467-019-08737-6. (PMCID: PMC6461669)
6. van der Klaauw AA, Croizier S, Mendes de Oliveira E, Stadler LKJ, Park S, Banton MC, Tandon P, **Hendricks AE,** Keogh JM, Riley SE, Papadia S, Henning E, Bounds R, Bochukova EF, Mistry V, O'Rahilly S, Simerly RB, INTERVAL, UK10KConsortium, Minchin JEN, Barroso I, Jones, EY, Bouret SG, Farooqi IS. Human Semaphorin 3 variants link melanocortin circuit development and energy balance. *Cell*, **2019.** Feb 7;176(4):729-742.e18. (PMCID: PMC6370916)
7. Riveros-McKay F, Mistry V, Bounds R, **Hendricks AE**, Keogh JM, Thomas, H, Henning E, Corbin LJ, Understanding Society Scientific Group, O'Rahilly S, Zeggini E, Wheeler E, Barroso I, Farooqi IS. Genetic architecture of human thinness compared to severe obesity, *PLoS Genetics,* **2019**. *15(1): e1007603*. (PMCID: PMC6345421)
8. **Hendricks AE**, Billups S, Pike HNC[#], Farooqi IS, Zeggini E, Santorico SA, Barroso I, Dupuis J. ProxECAT: Proxy External Controls Association Test. A new case-control gene region association test using allele frequencies from public controls. *PLoS Genetics*, **2018**. (PMCID: PMC6191077)
9. Tang, M.[#], Andersen V, **Hendricks AE**, Krebs NF. Different Growth Patterns Persist at 24 Months of Age in Formula-Fed Infants Randomized to Consume a Meat- or Dairy-Based Complementary Diet from 5 to 12 Months of Age. *The Journal of Pediatrics*, **2018.** (PMCID: PMC6389371)
10. The TELOMAAS group & Tomaszewski, M. BMI is negatively associated with telomere length; a collaborative cross-sectional meta-analysis of 87 observational studies. *American Journal of Clinical Nutrition*, **2018.** (PMID: 30535086)
11. Tang M[#], **Hendricks AE**, Krebs NF. A meat-or dairy-based complementary diet leads to distinct growth patterns in formula-fed infants: a randomized controlled trial. *American Journal of Clinical Nutrition*, **2018**. (PMCID: PMC6128676)
12. Turcot V., Lu Y., Highland H. M., Schurmann C., Justice A. E., Fine R. S., Bradfield J.P., Esko T., Giri A., Graff M., Guo X., **Hendricks A.E**.,… Loos, R. J. F. Protein-altering variants associated with body mass index implicate pathways that control energy intake and expenditure in obesity. *Nature Genetics*, *50*(1), 26–41. https://doi.org/10.1038/s41588-017-0011-x , **2018**. (PMCID: PMC5945951)
13. Moir L, Bochukova EG, Dumbell R, Banks G, Bains RS, Nolan PM, Scudamore C, Simon M, Watson K, Keogh J, Henning E, **Hendricks AE**, O'Rahilly S, Barroso I, Sullivan AE, Bersten DC, Whitelaw M, Kirsch S, Bentley E, Farooqi IS, Cox RD. Disruption of the homeodomain transcription factor orthopedia homeobox (Otp) is associated with obesity and anxiety. *Molecular Metabolism,* **2017**. (PMC5681237)
14. Tang M[#], Frank DN, **Hendricks AE**, Ir D, Esamai F, Liechty D, Hambidge KM, and Krebs NF. Iron in Micronutrient Powder Promotes an Unfavorable Gut Microbiota in Kenyan Infants. *Nutrients*, **2017**. (PMC5537890)

15. **Hendricks AE*,** Bochukova EG*, Marenne G, Keogh JM, Bounds R, Wheeler E, et al. Rare Variant Analysis of Human and Rodent Obesity Genes in Individuals with Severe Childhood Obesity. *Scientific Reports*, **2017** June, 1–14. (PMC5758507) https://doi.org/10.1038/s41598-017-03054-8 * Co-first authors

16. Tachmazidou I, Süveges D, Min JL, Ritchie GRS, Steinberg J, Walter, K., …**Hendricks, AE**, et al. Whole-Genome Sequencing Coupled to Imputation Discovers Genetic Signals for Anthropometric Traits. *AJHG* 865–884. **2017**. April. (PMC5473732) https://doi.org/10.1016/j.ajhg.2017.04.014

17. Lin H, Mueller-Nurasyid M, Smith A, Arking DE, Barnard J, Bartz TM, Lunetta KL, Lohman K, Kleber M, Lubitz SA, Feelhoed B, Trompet S, Niemeiher MN, Kacprowski T, Chasman DI, Klarin D, Sinner MF, Waldenberger M, Meitinger T, Harris TB, Launer LJ, Soliman EZ, Chen LY, Smith JD, Van Wagoner DR, Rotter JI, Psaty BM, Sie Z, **Hendricks AE**, et al. Gene-gene interaction analyses for atrial fibrillation. *Scientific Reports*, **2016** Nov 8;6:35371. (PMCID: PMC5099695)

18. Jeroncic A, Memari Y, Ritchie G, **Hendricks AE**, Kolb-Kokocinski A, Matchan A, Vitart V, Hayward C, Kolcic I, Glodzik D, Wright A, Rudan I, Campbell H, Durbin R, Polašek O, Zeggini E, Perica VB. Whole exome sequencing in an isolated population from the Dalmatian island of Vis. *EJHG,* **2016** Oct;24(10):1479-87. (PMCID: PMC4950961).

19. Santorico SA, **Hendricks AE**. Progress in Methods for Rare Variant Association. *BMC Genetics*, **2016** Feb 3;17 Suppl 2:6. (PMCID: PMC4895384)

20. The UK10K project: rare variants in health and disease. *Nature*, **2015** Oct 1;526(7571):82-90. (PMCID: PMC4773891)

21. Zhang X, Johnson AD, **Hendricks AE**, Hwang SJ, Tanriverdi K, Ganesh SK, Smith NL, Peyser PA, Freedman JE, O'Donnell CJ. Genetic Associations with Expression for Genes Implicated in GWAS Studies for Atherosclerotic Cardiovascular Disease and Blood Phenotypes. *Hum Mol Gen*, **2014** Feb 1;23(3):782-95. (PMCID: PMC3900869)

22. **Hendricks AE**, Dupuis J, Logue MW, Myers RH, Lunetta KL. Correction for multiple testing in a gene region. *EJHG*, **2014** Mar 22(3):414-8. (PMCID: PMC3925272)

23. Pearce LR, Atanassova N, Banton MC, Bottomley B, van der Klaauw AA, Revelli JP, **Hendricks A**, Keogh JM, Henning E, Doree D*,* Jeter-Jones S, Garg S, Bochukova EG, Bounds R, Ashford S, Gayton E, Hindmarsh PC, Shield JP, Crowne E, Barford D, Wareham NJ, UK10K Consortium, O'Rahilly S, Murphy MP, Powell DR, Barroso I, Farooqi IS. KSR2 Mutations Are Associated with Obesity, Insulin Resistance, and Impaired Cellular Fuel Oxidation. *Cell*, **2013** Nov 7; 155(4):765-77. (PMCID: PMC3898740)

24. **Hendricks AE**, Dupuis J, Gupta M, Logue MW, Lunetta KL: A comparison of gene region simulation methods. *PLoS One*, **2012**; 7:e40925. (PMCID: PMC3399793)

25. Hadzi TC, **Hendricks AE**, Latourelle JC, Lunetta KL, Cupples LA, Gillis T, Mysore JS, Gusella JF, MacDonald ME, Myers RH, Vonsattel JP: Assessment of Cortical and Striatal Involvement in 523 Huntington Disease Brains. *Neurology*, **2012** Oct 16;79(16):1708-1715. (PMCID: PMC3468776)

26. Lee JH, Lee JM, Ramos EM, Gillis T, Mysore JS, Kishikawa S, Hadzi T, **Hendricks AE**, Hayden MR, Morrison PJ, Nance M, Ross CA, Margolis RL, Squitieri F, Gellera C, Gomez-Tortosa E, Ayuso C, Suchowersky O, Trent RJ, McCusker E, Novelletto A, Frontali M, Jones R, Ashizawa T, Frank S, Saint-Hilaire MH, Hersch SM, Rosas HD, Lucente D, Harrison MB, Zanko A, Abramson RK, Marder K, Sequeiros J, Landwehrmeyer GB, Shoulson I, Myers RH, MacDonald ME, and Gusella JF: TAA repeat variation in the *GRIK2* gene does not influence age at onset in Huntington's disease. *Biochemical and Biophysical Research Communications*, **2012** Aug 3;424(3):404-8. (PMCID: PMC3752397)

27. Dumitriu A, Moser C, Hadzi T, Williamson S, Pacheco C, **Hendricks AE**, Latourelle JC, Wilk J, Destefano A, Myers RH: Post-mortem Interval Influences α-Synuclein Expression in Parkinson Disease Brain. *Parkinson's Disease*, **2012**. 614212, doi:10.1155/2012/614121. (PMCID: PMC3317023)

28. Chen H*, **Hendricks AE***§, Cheng Y, Cupples LA, Dupuis J, Liu CT: Comparison of statistical approaches to rare variant analysis for quantitative traits. *In BMC Proceedings,* **2011**. 5 Suppl 9:S113. (PMCID: PMC3287837) * Co-first authors § Corresponding author
29. Latourelle JC, **Hendricks AE**, Pankratz N, Wilk JB, Halter C, Nichols WC, Gusella JF, Destefano AL, Myers RH, Foroud T: Genomewide linkage study of modifiers of *LRRK2*-related Parkinson's disease. *Movement Disorders*, **2011** Sep; 26(11):2039-44. (PMCID: PMC3346677)
30. **Hendricks AE**, Latourelle JC, Lunetta KL, Cupples LA, Wheeler V, MacDonald ME, Gusella JF, Myers RH: Estimating the probability of *de novo* HD cases from transmissions of expanded penetrant CAG alleles in the Huntington Disease gene from male carriers of high normal alleles (27-35 CAG). *AJMG*, **2009**. 149A(7): 1375-81. (PMCID: PMC2724761)
31. **Hendricks AE**, Zhu Y, Dupuis J: Genome-wide association and linkage analysis of quantitative traits: comparison of likelihood ratio test and conditional score statistic. *BMC Proceedings* **2009**. 3 Suppl 7:S100. (PMCID: PMC2795871)
32. Dragileva E, **Hendricks A**, Teed A, Gillis T, Lopez ET, Friedberg EC, Kucherlapati R, Edelmann W, Lunetta KL, MacDonald ME, Wheeler VC: Intergenerational and striatal CAG repeat instability in Huntington's disease knock-in mice involve different DNA repair genes. *Neurobiol Dis* **2009**, 33:37-47. (PMCID: PMC2811282)
33. Swami M, **Hendricks AE**, Gillis T, Massood T, Mysore J, Myers RH, Wheeler VC: Somatic expansion of the Huntington's disease CAG repeat in the brain is associated with an earlier age of disease onset. *Hum Mol Genet* **2009**, 18:3039-3047. (PMCID: PMC2714728)
34. Manning AK, Ngwa JS, **Hendricks AE**, Liu CT, Johnson AD, Dupuis J, Cupples LA: Incorporating biological knowledge in the search for gene x gene interaction in genome-wide association studies. *BMC Proceedings* **2009**. 3 Suppl 7:S81 (PMCID: PMC2795984)
35. DeStefano AL, Latourelle J, Lew MF, Suchowersky O, Klein C, Golbe LI, Mark MH, Growdon JH, Wooten GF, Watts R, Guttman M, Racette BA, Perlmutter JS, Marlor L, Shill HA, Singer C, Goldwurm S, Pezzoli G, Saint-Hilaire MH, **Hendricks AE**, Gower A, Williamson S, Nagle MW, Wilk JB, Massood T, Huskey KW, Baker KB, Itin I, Litvan I, Nicholson G, Corbett A, Nance M, Drasby E, Isaacson S, Burn DJ, Chinnery PF, Pramstaller PP, Al-Hinti J, Moller AT, Ostergaard K, Sherman SJ, Roxburgh R, Snow B, Slevin JT, Cambi F, Gusella JF, Myers RH: Replication of association between ELAVL4 and Parkinson disease: the GenePD study. *Hum Genet* **2008**, 124:95-99. (PMCID: PMC2716559)
36. Latourelle JC, Sun M, Lew MF, Suchowersky O, Klein C, Golbe LI, Mark MH, Growdon JH, Wooten GF, Watts R, Guttman M, Racette BA, Perlmutter JS, Ahmed A, Shill HA, Singer C, Goldwurm S, Pezzoli G, Zini M, Saint-Hilaire MH, **Hendricks AE**, Williamson S, Nagle MW, Wilk JB, Massood T, Huskey KW, Laramie JM, DeStefano AL, Baker KB, Itin I, Litvan I, Nicholson G, Corbett A, Nance M, Drasby E, Isaacson S, Burn DJ, Chinnery PF, Pramstaller PP, Al-Hinti J, Moller AT, Ostergaard K, Sherman SJ, Roxburgh R, Snow B, Slevin JT, Cambi F, Gusella JF, Myers RH: The Gly2019Ser mutation in LRRK2 is not fully penetrant in familial Parkinson's Disease: the GenePD study. *BMC Medicine* **2008**, 6. (PMCID: PMC2596771)
37. Tobin JE, Latourelle JC, Lew MF, Klein C, Suchowersky O, Shill HA, Golbe LI, Mark MH, Growdon JH, Wooten GF, Racette BA, Perlmutter JS, Watts R, Guttman M, Baker KB, Goldwurm S, Pezzoli G, Singer C, Saint-Hilaire MH, **Hendricks AE**, Williamson S, Nagle MW, Wilk JB, Massood T, Laramie JM, DeStefano AL, Litvan I, Nicholson G, Corbett A, Isaacson S, Burn DJ, Chinnery PF, Pramstaller PP, Sherman S, Al-Hinti J, Drasby E, Nance M, Moller A, Ostergaard K, Roxburgh R, Sherman SJ, Roxburgh R, Snow B, Slevin JT, Cambi F, Gusella JF, Myers RH: Haplotypes and gene expression implicate the MAPT region for Parkinson disease: the GenePD Study. *Neurology* **2008**, 71:28-34. (PMCID: PMC2654275)

CONSORTIUM PUBLICATIONS

The publications listed above and on which my Google Scholar metrics are based are those on which I made a substantial contribution to the particular publication. Below are consortiums for which I played a considerable role. Given this, there are papers (that I do not list above or include in my metrics) on which I am listed as an author through my membership in the consortium.

UK10K Project (http://www.uk10k.org): I was one of four post-doctoral fellows funded directly on the UK10K project. I was the lead statistician and analyst on the obesity arm of the project and also contributed to the cohorts group, the statistics group, and the writing group. Since the UK10K project was one of the first large scale high-throughput sequencing studies, a substantial portion of my time was spent on identifying the appropriate quality control and statistical analysis frameworks to use for the whole-exome and whole-genome sequencing data.

BOOK CHAPTERS

Morris & Zeggini. Assessing Rare Variation in Complex Traits. Chapter: (Hendricks, AE) *Use of Appropriate Controls in Rare-Variant Studies* (239-252). Springer. 2015.

FUNDING HISTORY (Funded)

EXTERNAL

PAR-15-024 (Krebs, AMC) 7/01/2018-3/30/2023 0.15 FTE (Y1-Y5)
Co-I; **"**Predicting health outcomes of Mediterranean diet via metabolomics of foods and biospecimens"
NIH/NIDDK $499,999 Y1 direct

OPP1055867 (Krebs/Hambidge, AMC) 6/1/2018-10/31/2019 0.2 FTE (Y6-Y7)
Co-I; "Preconception Maternal Nutrition" – supplement to fund phenotyping and analysis of biomarkers
Bill & Melinda Gates Foundation/ Global Development

National Pork Board (Tang, AMC) 5/2019-4/2022
Co-I; "Meat consumption during infancy on growth, gut health, sleep and neurodevelopment: a randomized controlled trial"
$286,000 direct

Foundation for Meat and Poultry Research and Education (Tang, AMC) 3/1/2019-8/30/2020
Co-I; "Meat as a first solid food on risk of overweight and neurodevelopment in infants"
$192,884 direct

FUNDING HISTORY (Previous)

EXTERNAL

The Jayne Koskinas Ted Giovanis Foundation for Health and Policy (Bacher) 9/1/2018-8/31/2019
Co-PI; **"**Uncovering the Life Clock of Red Blood Cells Using Single-Cell Analysis"
$15,000 direct

R03-DE025363 (Shaikh, AMC) 07/01/2015-6/30/2017 0.2 FTE (Y1-Y2)
Co-PI; "Genomewide Copy Number Variation Analysis and Association with Facial Shape Variation"
NIH/NIDCR $150,000/yr
Funding request included a graduate research assistant under my supervision

Collaborative Research Travel Grant 09/01/2015 – 12/31/2016

PI; "Incorporating genome-wide information to find disease associated genes"
Burroughs Wellcome Fund $10,000
To build collaboration with human geneticists to foster the development of a new statistical method.

INTERNAL

College of Liberal Arts and Sciences Dissemination Grant 2018
PI; To support travel to the Joint Statistical Meeting to present Proxy External Controls Association Test.
$2,000

Office of Research Services 5/2017 – 8/2017
PI; **"**Identifying genetic determinants of immunotherapy success and brain metastasis in melanoma patients"
Funding to support a summer graduate student to complete analysis under my supervision.
$2973.00

Office of Research Services 11/2016
PI; To support collaborative travel to the Wellcome Trust Sanger Institute
$1977.73

FUNDING HISTORY (Submitted)

EXTERNAL

R35; (Hendricks) 9/1/2020 – 8/31/2025 0.5 Y1; 0.25 Y2-Y5
PI; "Methods to enable robust and efficient use of genetic summary data"
NIH/NHGRI $283,976 direct Y1. Funding request includes 2 graduate students, 1 post-doctoral fellow, and 3 undergraduate researchers.

R01; (PI: Fishbein) 9/1/2020 – 8/31/2025 0.1 Y1; 0.15 Y2-Y5
Co-I; "Inherited genetic variation and penetrance of Hereditary Paraganglioma-Pheochromocytoma Syndrome"
NCI $250k/yr direct cost

R01; (PI: Norman) 7/1/2020 – 6/30/2025 0.05 Y1-Y5
Co-I; "insights Into Immune-Related Diseases Born from Population Genomics" NIAID U01 AI090905
$549k/yr direct cost

EXTERNAL PRESENTATIONS

Invited

November 2019	*Estimating and modeling substructure within 'omics data*, Broad Institute of MIT and Harvard, Cambridge, MA
April 2019	*Methods to Improve the use of Common Controls in Sequencing Studies*, University of Florida Department of Biostatistics, Gainsville, FL
March 2019	*ProxECAT: A Case-Control Gene Region Association Test using Allele Frequencies from Public Controls*, Eastern North American Region of the International Biometric Society (ENAR), Philadelphia, PA
March 2019	*Using Common Controls*, NHGRI's Genome Sequencing Project Annual Meeting, Bethesda, MD
February 2019	*Statistical complications and solutions for using common controls in genetic sequencing studies*, Stat Alliance, Colorado State University

January 2019	*Using Common Controls*, NHGRI's Genome Sequencing Project Common Controls Working Group, Virtual
March 2018	*Proxy External Controls Association Test (ProxECAT)*, NHLBI Trans-Omics for Precision Medicine (TOPMed) Analysis Committee, Virtual
November 2016	*Methods for association testing with massively different sequencing depths of coverage*, Wellcome Trust Genome Sciences Campus, UK
June 2016	*A new method for gene region association testing with massively different sequencing depths of coverage*, Human Genetics Retreat, Wellcome Trust Sanger Institute, UK
June 2015	*Methods for Studying Rare Variants in Next Generation Sequencing Data*, The Mathematical Sciences in Obesity, NIDDK Short Course – University of Alabama Birmingham
April 2013	*Identifying and correcting for biases in experiments with external controls: An example from next generation sequencing*, Statistical Genetics Working Group, Boston University
January 2012	*Evaluation of Gene Region Summary Methods*, First Friday Talks, Institute for Behavioral Genetics at the University of Colorado

Refereed (peer reviewed)

October 2019	*Exome sequencing identifies multiple genes and gene-sets associated with severe childhood obesity*, American Society of Human Genetics, Houston (poster)
August 2019	*Successful and sustainable undergraduate research in statistics through vertical integration of experience and horizontal integration of disciplines*, Joint Statistical Meeting, Denver (speed talk)
October 2018	*Identifying Hidden Ancestries in Publicly Available Summary Data*, International Genetic and Epidemiology Society, San Diego
October 2018	*Identifying Hidden Ancestries in Publicly Available Summary Data*, American Society of Human Genetics, San Diego (poster)
August 2018	*ProxECAT: Proxy External Controls Association Test: A new case-control gene region association test using allele frequencies from public controls*, Joint Statistical Meeting, Vancouver (speed talk)
October 2016	*A new method for gene region association testing with massively different sequencing depths of coverage*, International Genetic and Epidemiology Society, Toronto
October 2016	*A new method for gene region association testing with massively different sequencing depths of coverage*, American Society of Human Genetics, Vancouver
October 2014	*Next steps for whole exome sequenced cases: imputing non-coding regions and incorporating whole genome sequenced controls*, American Society of Human Genetics, San Diego (poster)
June 2012	*Finding Obesity Genes by Whole Exome Sequencing in a UK Cohort of Severely Obese Children*, American Diabetes Association, Philadelphia
November 2012	*Finding Obesity Genes by Whole Exome Sequencing in a UK Cohort of Severely Obese Children*, Program in Quantitative Genomics, Boston, MA (poster) *Stellar Abstract Award
October 2012	*Whole Exome Sequencing Cases: Finding and Testing with External Controls*, American Society of Human Genetics, San Francisco, CA (poster)
October 2010	*The Signal vs. Noise Balance: Exploring Gene Summary Methods*, American Society of Human Genetics, Washington D.C. (poster)

October 2010	*Retaining Power: Is it Possible to Simply and Effectively Adjust for Multiple Comparisons in a Candidate Gene Region?* International Genetic and Epidemiology Society, Boston, MA (poster)
October 2009	*A Comparison of Single and Multi-SNP Methods to Summarize Genetic Variation at Candidate Loci*, American Society of Human Genetics, Honolulu, HI (poster)
October 2009	*A Comparison of Methods for Simulating a Gene Region with a Specified LD Structure*, International Genetics and Epidemiology Society Meeting, Kahuku, HI (poster)
October 2008	*Genome-wide association and linkage analysis of quantitative traits: comparison of likelihood ratio test and conditional score statistic*, Genetic Association Workshop, St. Louis, MO (poster)
August 2008	*Estimating Risk for Transmission of Expanded CAG Alleles in the Huntington's Disease Gene from Male Carriers of Intermediate Alleles*, American Statistical Association Joint Statistical Meeting Denver, CO (poster)

INTERNAL PRESENTATIONS

April 2019	*Methods to Improve the use of Common Controls in Sequencing Studies*, Department of Integrative Biology, University of Colorado Denver
April 2018	*ProxECAT: Proxy External Controls Association Test. A new case-control gene region association test using allele frequencies from public controls*, The Power of Informatics to Advance Health Mini-Symposium, University of Colorado — Anschutz Medical Campus
March 2018	*Genetic Analysis in the Era of Big Data*, Colorado Center for Personalized Medicine, University of Colorado — Anschutz Medical Campus
October 2017	*Gene region association testing using summary level external controls*, Human Medical Genetics and Genomics 2017 Retreat, University of Colorado — Anschutz Medical Campus
April 2015	*The Necessity of Bioinformatics in Next Generation Sequencing*, The Power of Informatics to Advance Health, University of Colorado — Anschutz Medical Campus
October 2014	*Analysis Using Exome Sequenced Cases and Population Controls*, Human Medical Genetics and Genomics 2014 Retreat, University of Colorado — Anschutz Medical Campus
April 2014	*Exome Sequencing of over 700 Severe Obesity Cases: Study Design, Challenges, & Initial Results*, Department of Integrative Biology Spring Seminar Series, University of Colorado — Denver
November 2013	*Whole Exome Sequencing Case-Control using 1,000 Severe Obesity Cases Identifies Putative New Loci and Replicates Previously Established Loci*, Butcher Symposium, Colorado (poster)
October 2013	*Exome Sequencing of over 700 Severe Obesity Cases: Study Design, Challenges, & Initial Results*, Human Medical Genetics and Genomics Program Seminar Series, University of Colorado — Anschutz Medical Campus
October 2013	*Case-Control Analysis with Whole Exome Sequenced Cases: Challenges and Initial Results*, Statistical Genetics and Genetic Epidemiology Journal Club, CU – Anschutz Medical Campus
June 2013	*SCOOP Case-Control Analysis: Challenges and Initial Results*, UK10K Annual Meeting, Cambridge, UK

May 2013	*Insights from Exome Sequencing 1000 Severe Childhood Obese Cases*, Wellcome Trust Sanger Institute Human Genetics Retreat & Scientific Advisory Board Meeting, Cambridge, UK
July 2012	*Exome Sequencing in Severe Obese Children*, UK10K Annual Meeting, Cambridge, UK
July 2012	*Case-Control Analysis using External Controls*, UK10K Annual Meeting, Cambridge, UK
March 2012	*UK10K Obesity: From exome sequencing to potential hits, Human Genetics Team Talks*, Wellcome Trust Sanger Institute, Cambridge, UK
June 2011	*Exploration of Gene Region Simulation, Correction for Multiple Testing, and Summary Methods*, Dissertation Committee and Audience, Boston University
January 2010	*Gene Region Summary Methods*, Statistical Genetics Working Group, Boston University

PROFESSIONAL AFFILIATIONS

Member, American Statistical Association (ASA)
Member, American Society of Human Genetics (ASHG)
Member, Association for Women in Mathematics (AWM)
Member, International Genetic and Epidemiology Society (IGES)
Member, Global Alliance for Genomics and Health (GA4GH)
Member, Society for Industrial and Applied Mathematics (SIAM)
Member, Western North American Region International Biometric Society (WNAR)

FORMAL MENTORING/ADVISING

Primary Advisor of PhD Thesis Research

2017 – Present	Megan Sorenson
2019 – Present	Nicholas Weaver

Primary Advisor of Statistics Certificate/Master's Project Research

2019 – Present	Valentinas Sungaila, MS Statistics, expected Spring 2020
2019 – Present	Kathleen Gatliffe, MS Statistics, expected Fall 2020
2019 – Present	Jessica Murphy, MS Statistics, expected Fall 2020
2019 – Present	Lee Panter, MS Statistics, expected Spring 2020
2018 – 2019	Matthew Lanz, MS Applied Mathematics, Project Title: *Causal Mediation Analysis: A method study and application*
2018	Sam May, Undergraduate Statistics Certificate, Project Title: *The EM Algorithm and its Application to Finite Mixtures*
2017	Daniel Klie, MS Statistics, Project Title: *Evaluating the Impact of the Promoting Success in Early College Mathematics through Graduate Teacher Training Project*
2017	Leonard Strnad, MS Statistics, Project Title: *Overview and TensorFlow Implementation of Diet Networks: Thin Parameters for Fat Genomics*
2017	Cailin McCloskey, MS Statistics, Project Title: *Studying the Genetics of Melanoma: Data Preparation, Quality Control, and Analysis Design*
2016 - 2017	Megan Sorenson, MS Statistics, Project Title: *Genome-wide analysis of copy number variation and common facial variation in a large cohort of Bantu Africans*

2016 - 2017	Lauren Hall, MS Statistics, Project Title: *Is the False Discovery Rate Higher for Open Access Journals? A Comparison of FDR Estimates in Oncology Journals.*
2016 - 2017	Chinyere Okpara, MS Statistics, Project Title: *Analysis of the Colorado Death Penalty Cases: Beyond Aggravating and Mitigating Factors*
2014 - 2015	Alec McQuilkin, MS Applied Mathematics Statistics Concentration, Project Title: *Incorporating Relatedness in Gene Based Case-Only Analysis of Mendelian Traits*
2014 - 2015	Kraig Thomas, MS Applied Mathematics Statistics Concentration, Project Title: *Modeling Regular Season Winning Percentage in the NFL*
2014	Chad Jeffers, Undergraduate Statistics Certificate, Project Title: *Modeling Regular Season Winning Percentage in the NFL*
2014	Zhiyuan Guan, MS Applied Mathematics Statistics Concentration, Project Title: *How to appropriately account for autocorrelation in financial models*

Statistical Mentor

2013 – Present Dr. Minghua Tang

CMH-Pilot (Tang, AMC) 2/1/2014 – 1/31/2015 CCTSI
Statistical Mentor; "High protein consumption from meat vs. dairy as complementary"

1 K01 DK111665-01 (Tang, AMC) 9/01/2016-8/30/2020 NIH/NIDDK
Statistical Mentor; **"**Protein Quality Early in Life: Mechanisms of Growth and Later Obesity Development"

Advisor for Research Assistants

2019	Jessica Murphy, PhD Student, Graduate Research Assistant
2019	Nicholas Weaver, PhD Student, Graduate Research Assistant
2017	Cailin McCloskey, MS Student, Graduate Research Assistant
2016 – 2017, 2019	Megan Sorenson, PhD Student, Graduate Research Assistant

Vertically Mentored Research Teams

Hidden Ancestries

2018 - Present	Jordan Hall, PhD, Graduate Research Assistant and co-Mentor
2018 - Present	Megan Sorenson, PhD, co-Mentor
2019 - Present	Ian Arriaga MacKenzi, BS-Math, Undergraduate Research Assistant
2019 - Present	Gregory Matesi, BS-Math, Undergraduate Research Assistant
2018 - Present	Alexandria Ronco, BS-Math, Undergraduate Research Assistant
2019	Andrew Zerwick, HS teacher, Research Assistant
2018 - 2019	James Vance, BS-Math, Undergraduate Research Assistant
2018 - 2019	Jinyan Lyu, BS-Math (2019), Undergraduate Research Assistant
2018 - 2019	Ryan Scherenberg, BS-Business (2019), Undergraduate Research Assistant
2018 - 2019	Yinfei Wu, BS-Math BS-Economics (2019), Undergraduate Research Assistant
2018	Tiffany Dinh, BS-Biology (2019), Undergraduate Research Assistant
2018	Kendra Koach, BS-Math (2018), Undergraduate Research Assistant

**Awards*

- Ian Arriaga MacKenzi, Gregory Matesi, and Alexandria Ronco. Undergraduate Research Opportunity Program, University of Colorado Denver, Award to travel to the International Genetic and Epidemiology meeting to present work (2019)
- Jordan Hall, University of Colorado Graduate School Dean's Distinguished Student Service Award (2019)

Longitudinal Mouse Studies

2019 – Present	Nicholas Weaver, PhD, co-Mentor
2019 – Present	Jessica Murphy, MS-Statistics, Research Assistant
2019	Pitshou Nzazi Duki, BS-Math, Undergraduate Research Assistant

Other Undergraduate Research

2019 - Present	Catherine Fitch, Mentor for mini-UROP research project

Lab Rotation/Internship

2019/2020 Winter	Katie Marker, University of Colorado Anschutz Medical Campus, Human Medical Genetics and Genomics Program, PhD Student, Lab Rotation
2018/2019 Winter	Evan Sticca, University of Colorado Anschutz Medical Campus, Human Medical Genetics and Genomics Program, PhD Student, Lab Rotation
2018 Spring	Hamish Pike, University of Colorado Anschutz Medical Campus, Human Medical Genetics and Genomics Program, PhD Student, Lab Rotation
2016 Winter	Ben Kitchen, Denver School of Science and Technology, High School Junior, Intern

Teaching Assistant Mentor

Fall 2018	Amit Sengupta, Applied Mathematics PhD Student
AY 2017-2018	Livvia Bechtold, Applied Mathematics PhD Student
AY 2016-2017	Michael Pilosov, Applied Mathematics PhD Student
AY 2015-2016	Aaron Nielson, Applied Mathematics PhD Student

Committees: PhD Thesis (*Committee chair)

Current:

Hamish Pike* (PhD in Human Medical Genetics and Genomics, expected 2021)
Emileigh Willems* (PhD in Applied Mathematics concentration in Statistics, expected Spring 2020)

Previous:

Subrata Paul (2019, PhD in Applied Mathematics concentration in Statistics)
Genevieve Andersen* (2019, PhD in Human Medical Genetics and Genomics)
Monchai Kooakachai (2019, PhD in Applied Mathematics concentration in Statistics)
Aaron Nielson (2018, PhD in Applied Mathematics)
Sesha Dassanayaka* (2016, PhD in Applied Mathematics concentration in Statistics)
Daniel Yorgov (2016, PhD in Applied Mathematics concentration in Statistics)

Committees: Honors Project, Statistics Certificate, Masters Project

Aixin Zhang (expected 2020, MS in Statistics)
Nicholas Weaver (2019, MS in Statistics)
Michael Ingram (2019, MS in Statistics)
Arlin Tawzer (2019, MS in Statistics)
Gordon Kordas (2019, MS in Biostatistics)
Kate Booth (2019, MS in Applied Mathematics)
Selah Chanthan (2019, MS in Statistics)
Emileigh Willems (2018, MS in Statistics)
Xingmeng Zhao (2017, MS in Applied Mathematics)
Jason Fagerness (2017, MS in Applied Mathematics)
Lucas Ortiz (2016, MS in Applied Mathematics Concentration in Statistics)
Long Fu (2016, MS in Applied Mathematics)

Mengjie Yao (2016, MS in Applied Mathematics)
Nathaniel Brown (2015, MS in Applied Mathematics)
Takao Miller (2015, MS in Applied Mathematics)
Hannah Dauber (2015, MS in Applied Mathematics)
Lauren Hall (2014, Undergraduate Honors Project)
Melissa Bilbao (2014, MS in Applied Mathematics)
DeVon Farago (2014, Graduate Statistics Certificate)
Andie Nye (2014, MS in Applied Mathematics)

Mentoring Prior to Fall 2013

Fall 2012-Summer 2013	Co-mentor Cambridge University MPhil Student, Nathan Nakatsuka, with Inês Barroso at the Wellcome Trust Sanger Institute
Fall 2004-Summer 2009, Fall 2012-Summer 2013	Advisor, Kappa Alpha Theta – Zeta Mu Chapter, MIT, Cambridge, MA
Summer 2009-March 2011	Advisory Board Chairman, Kappa Alpha Theta – Zeta Mu Chapter, MIT, Cambridge, MA
Fall 2003-Spring 2004	Advisor, Kappa Alpha Theta – Eta Iota Chapter, MIT, San Diego, CA

TEACHING

Learning Assistants

Fall 2019	Lu Vy. "Introduction to Statistical and Machine Learning", University of Colorado Denver (MATH 4027/5027)
Spring 2019	Samone Hubbart. "Applied Statistics", University of Colorado Denver, (MATH 4830/5830)
Spring 2018	Mari Kuker and Shannon Robinson. "Introduction to Statistics", University of Colorado Denver, (MATH 2830)

Courses Taught

Applied Statistics	MATH 4830/5830	CU Denver
Applied Regression Analysis	MATH 4387/5387	CU Denver
Experimental Design (Developed new course in 2014)	MATH 4294/5394	CU Denver
Introduction to Mathematical Statistics	MATH 4820/5320	CU Denver
Introduction to Statistical and Machine Learning (Developed new course in 2019)	MATH 4027/5027	CU Denver
Introduction to Statistics	MATH 2830	CU Denver
Statistical and Machine Learning / Advanced Statistical Methods for Research	MATH 6388	CU Denver
Topics in Applied Mathematics – Experimental Design (Developed new course in 2016)	MATH 5027	CU Denver
Introduction to Statistical Computing	BIOS 723	Boston University SPH

Readings Courses (1 credit)

Summer 2019	Non-parametric Longitudinal Analysis, 1 enrolled graduate student

Spring 2019	Mixed Linear Effects Models with application to immune deficient mice studies, 1 enrolled graduate student
Fall 2017	Deep Learning: A new application to genetics, 11 enrolled graduate students
Fall 2016	A new method to incorporate publicly available data, 7 enrolled graduate students
Summer 2015	Cluster Analysis, 2 enrolled graduate students
Fall 2014	Kernels, 2 enrolled graduate students

Independent Studies

Fall 2019	Lee Panter, Masters, *Single Cell Analysis with Generalized Estimating Equations and Linear Mixed Effects Models*
Summer 2019	Jessica Murphy, Masters, *Linear Mixed Effects Models with an Application to Mouse Studies*
Spring 2019	Gregory Matesi, undergraduate, *Mixture Models with an Application to Identifying Hidden Ancestries*
Fall 2018	Alexandria Ronco, undergraduate, *Hidden Ancestries*
Fall 2018	Jinyan Lyu, undergraduate, *Bootstrapping and Extensions*
Summer 2018	Samuel May, *Master's Project Course: The EM Algorithm and its Application to Finite Mixtures*
Spring 2018	Sebastian Del barco, undergraduate, *Distributions! A new look U.S. Median House Prices after the 2008 Housing Crisis*
Fall 2017	Leonard Strnad, MS, *Master's Project Course: Deep Learning, Genomic Data and TensorFlow*
Fall 2017	Cailin McCloskey, MS, *Master's Project Course: Studying the Genetics of Melanoma: Data Preparation, Quality Control, and Analysis Design*
Fall 2017	Sebastian Del barco, undergraduate, *Generalized Linear Models with an Application to Time to Brain Metastasis and Response to Immunotherapy in Melanoma Patients*
Spring 2017	Chinyere Okpara, MS, *Master's Project Course: Analysis of the Colorado Death Penalty Cases:Beyond Aggravating and Mitigating Factors*
Summer 2017	Daniel Klie, MS, *Master's Project Course: Promoting Success in Early College Mathematics through Graduate Teacher Training Project*

Lectures

Summer 2016-2019	Instructor (week of morning instruction), “Fitting Models to Data”, Colorado Summer Institute for Biostatistics (Co-SIBs), Colorado School of Public Health
Spring 2015-2018	Faculty Lecturer, “Sequence Based Studies”, University of Colorado, Anschutz Medical Campus, HMGP7600: Graduate Survey of Human Genetics
Fall 2016	Faculty Lecturer, “Methods for studying rare variants in next generation sequencing data”, University of Colorado, Anschutz Medical Campus, BSBT 6111: Introduction to Biomedical Data Science
Fall 2014-2015	Instructor (a week of instruction), “Exome Sequencing: annotation, quality control, and analysis”, Wellcome Genome Campus, Advanced Course on Exome Sequencing

Spring 2012 & Fall 2013	Lecturer, "Complex Diseases & Exome Sequencing: An introduction to study design and analysis", Wellcome Genome Campus, Advanced Course on Exome Sequencing
Spring 2011	Lecturer, "Sequence Data: The statistical analysis of rare variants", Boston University School of Public Health, (Applied Statistical Genetics; Biostatistics 859)
Fall 2009	Lecturer, "Methods of Evidence-Based Medicine and Decision Analysis", Boston University Medical School
Spring & Summer 2009	Lecturer, "Statistical Genetics", Upward Bound—a program for high school students who are aiming to be first generation college students

Teaching Assistant

Biostatistics in Epidemiology	BIOS 852	Boston University SPH
Genetics and Genomics	Genetics 701	Boston University SGMS
Introduction to Biostatistics	E-102	Harvard Extension School
Introduction to Statistics	E-50	Harvard Extension School

UNIVERSITY SERVICE AND LEADERSHIP

Administrative Responsibilities

2016 – Present	Organizer for the Statistical Genetics Working Group bi-weekly meetings
2018 – Present	Organizer for Mathematical and Statistical Sciences Departmental Open House

College Committees

2020	CLAS Excellence in Research Review Committee
2018	CLAS Strategic Planning Initiative Student Success Subcommittee

Mathematical and Statistical Sciences Departmental Committees

2019-present	Graduate Admissions Committee
2018-2019	Search Committee for Assistant Professor of Optimization
2017-2019	Executive Committee
2013-2014, 2015-2018	Undergraduate Committee
2013-2017	Statistics Committee to revise statistics curriculum
2013-2016	Search Committee for Assistant Professor of Statistics
2014-2015	Graduate Committee
2014-2015	Merit Committee

Other Departmental Committees

2018 – Present	Human Medical Genetics and Genomics Seminar Committee

SERVICE TO THE PROFESSION

Study Sections

Member of a NIH Study Section for Fellowships, (Fall 2014 & 2015, Summer 2016, 2017, & 2018)

Committees and Leadership Positions

International Genetic and Epidemiology Society (IGES) Young Investigator Committee (Fall 2015 – Fall 2018)

Boston Chapter of the American Statistical Association, Vice President (2010)

Boston Chapter of the American Statistical Association, Planning Committee (2009-2011)

Chaired Sessions
International Genetic and Epidemiology Society 2015 Conference, *Cross-Consortia and Mega-Cohorts: Ongoing and future directions*

Mentorship
American Society of Human Genetics (ASHG) Mentor-Mentee Lunch (2014, 2016, 2017, 2018)

International Genetics and Epidemiology Society (IGES) Mentor-Mentee Lunch (2018, 2019)

Other
Organized judging for trainee poster competition for International Genetic and Epidemiology Society Young Investigator Committee (Fall 2016 & 2018)

SCIENCE COMMUNICATION AND OUTREACH

August 2019	Panel on Research in Data Science, Data Science Symposium, CU Denver
May 2016	Math Teacher's Circle
April 2016	Lecture at The Carillon, an assisted living community, entitled *Stats in the News*
April 2016	Panel for Women in STEM, CU Denver
March 2016	*Statistics in the News*, Mini-STEM, University of Colorado Denver

PEER REVIEW - JOURNALS

American Journal of Clinical Nutrition, American Journal of Human Genetics, Bioinformatics, BMC Bioinformatics, BMC Biology, Circulation, Clinical Genetics, The European Journal of Human Genetics, eLIFE, GAW Proceedings, Genetic Epidemiology, Human Genetics, Journal of the American Heart Association, Nature Genetics, PLoS Genetics, and others